The effect of fibre sources on the performance of young rabbits

G.E. Jokthan¹, J.P. Alawa¹, I.A. Adeyinka² and A.M. Adamu²

¹Department of Animal Science, Ahmadu Bello University, Zaria

²National Animal Production Research Institute, Ahmadu Bello University, Zaria

Abstract

A feeding trial lasting 84 days was conducted using 45 weaned rabbits (with weight range 643-652g) to investigate the effect of using millet husk (MH), Rice bran (RB) and Sorghum panicle (SP) as fibre sources for growing rabbits in a completely randomized design. Forty-five young rabbits were randomly assigned to 3 treatment groups. Fifteen rabbits per treatment. MH, RB and SP were incorporated at the rate of 150g/Kg of diets. The diets were isonitrogenous (16% CP). The effect of these fibre sources on average daily feed intake (ADFI), average daily gain (ADG), feed efficiency and nutrient digestion was determined. Results of the study showed that Rabbits on MH based diet had a significantly higher ($P>0.05$) ADFI, feed efficiency and final weight. Though the result of ADG and average daily crude fibre intake was highest in the MH diet, it was not significantly ($P>0.05$) different from the result obtained for RB. The RB diet had a better digestibility of all nutrients. This was however not reflected in the performance of the rabbit. It was concluded that different sources of fibre affect the performance of rabbits differently. In this study, MH was superior to RB and SP as a fibre source for growing rabbits. It is therefore necessary to study the effect of different fibre sources before incorporating them in concentrate diets.

Keywords: Fibre, young rabbit.

Introduction

Fibre is defined as that portion of a feedstuff that is insoluble, less digestible, ash free and the remains of rigorous boiling with dilute alkali or dilute acid (Cullison, 1979). Van Soest and Robertson (1979) defined fibre as the polymeric substance from plants that are resistant to mammalian digestive enzyme. The fibre content of a feedstuff is, therefore an important factor determining its nutritive value. This is because it largely determines the proportion of chemically available nutrients, which can be utilized by animals.

The utilization of fibre in livestock nutrition in

general and rabbits in particular has been of major concern to livestock nutritionists largely due to the abundant availability of fibrous agricultural and industrial by-products. It is important therefore, to have a clear understanding of dietary fibre and the role it plays in rabbit nutrition especially from the standpoint of digestive energy intake as well as the efficiency of the rabbit digestion of various fibrous by-products. The significance of fibre in the nutrition of rabbits has been reviewed (Jokthan, 2001; Champe and Maurice, 1983; Cheeke *et al.*, 1987; Lebas and Laplace, 1977). Fibre in a diet among other things improves feed intake, better growth rate, improves digestion by opening up concentrate feed material. Low fibre diets

predispose rabbits to cecal-colonic hypomotility and diarrhoea due to proliferation of pathogens because of carbohydrate overload of the hindgut.

According to Crampton and Harris (1969), the fibres of some feedstuff are of such a nature that it is physically irritating to the point of being objectionable or even actively harmful. In some non ruminant animal, the volatile fatty acids produced as a result of microbial fermentation of fibre residue are irritants that stimulate peristalsis. From these studies it became clear that a consideration of the combined structure, chemical composition, physical properties and fermentability of a fibre source relative to its effect in the diet might be a better indicator of the nature and effect of fibre in the diet. The present study was therefore, designed to determine the effect of 3 fibre sources namely Rice bran (RB), Sorghum panicle (SP) and millet husk (MH) on feed intake, growth rate and nutrient digestion in rabbits.

Materials and Methods

Forty-five New Zealand White rabbits purchased from College of Agric, Mando, were used in this study. The rabbits were about eight weeks of age and ranged in weight between 643.21 g and 652.3 2g. All the rabbits were treated against endo and ecto parasites. Prior to the experiment, rabbits were housed in groups in pens on concrete floor covered with wood shavings. Three concentrate diets that were isonitrogenous (16% CP) were formulated. The three fibre sources RB, MH and SP were incorporated at 150g/kg of diet.

At the start of the experiment, 15 rabbits each

were randomly assigned to the three dietary treatments in a completely randomised design. Rabbits were ear tagged and assigned to individual wire cages each equipped with feeder and drinker. During the experimental period, which lasted 84 days, 200g of the experimental diets was provided once daily to each of the experimental animals at 08.00h. The next day, feed left over by each of the rabbits was collected and weighed to determine the amount of feed consumed by individual rabbits. Water was provided *ad libitum* and changed daily. Rabbits were weighed individually once a week.

The digestibility study lasted 10 days. 12 rabbits randomly selected from, those that had completed the feeding trial were assigned to improvised metabolism cages. An initial 10 days adjustment period was allowed before a 10-day actual faecal collection. Proximate analyses of the fibre sources and diets were carried out according to AOAC (1975) procedure. In addition. Millet husk. Rice bran and Sorghum panicle were analysed for cellulose, hemicellulose, lignin, acid detergent fibre and neutral detergent fibre using the procedure described by Van Soest (1967). Data obtained was analysed using the General Linear Models procedure (PROC GLM) of SAS (1987).

Results and Discussion

Chemical compositions of the various fibre sources used in the study are presented in Table 1. The fibre sources had very low CP content. DM content was generally high. This is a reflection of the nutrient value of most agricultural by-products. Millet husk had the least content of ADF while the NDF values were relatively high for MH and SP. Rice bran had the highest lignin

Different fibre sources in rabbit diets

Table 1: Proximate Composition (g/kg) of RB MH and SP used in the experiment

	RB	MH	SP
DM	982.6	997.7	982.7
CP	47.8	49.4	23.8
EE	38.8	28.8	27.1
NDF	555.3	757.2	725.0
ADF	500.8	464.9	547.1
Cellulose	256.4	365.1	396.9
Hemi cellulose	54.5	292.3	179.9
Lignin	124.3	54	103.4
Ash	185.3	87.9	99.5
GE	NA	NA	NA
RB – Rice Bran	MH –Millet husk	SP- Sorghum panicle	

Table 2: Ingredient composition of the Experimental diet (g/kg)

	Sources of fibre		
Ingredients	RB	MH	SP
Maize	540.35	530.63	520.54
Soyabean	250.95	266.67	270.76
RB	150	-	-
MH	-	150	-
SP	-	-	150
Salt	0.50	0.50	0.50
Limestone	20.0	20.0	20.0
Bonemeal	20.0	20.0	20.0
Premix	0.20	0.20	0.20
Cal Energy (ME Kcal/kg)	2705.5	2709.7	2713.2

Table 2 shows the composition of the experimental diets. The calculated energy values of the different diets were similar and therefore comparable. The inclusion of the different fibre sources at the same level (150g/kg) did not significantly affect the energy content of the diet. The proximate composition of the experimental diets (Table 3) indicates that RB and SP have comparable crude fibre values, which are higher than crude fibre of MH. A large proportion of the CF contained in RB and SP diets is made up of lignin as shown in the lignin content of RB and SP. MH contained appreciate amount of cellulose while SP also contained high proportion of cellulose (Table 1). Table 4 shows the performance of rabbits fed the various experimental diets. Rab-

bits fed the MH based diet had a significantly ($P<0.05$) higher Average Daily feed intake and higher Average Daily Crude protein intake and a higher feed / gain ratio.

The Average daily gain though higher than that obtained from the RB based diet is not significantly different ($P<0.05$). It is however, significantly ($P<0.05$) higher than that obtained for the SP based diet. The ADFI obtained for all the fibre sources are higher than values reported by Olubukola (1995), Champe and Maurice (1983), 54.1g. The ADG values obtained for all the fibre sources are higher than the value of 11.9g reported by Champe and Maurice (1983) and Atef and Ahmed (1986).

Table 3: Proximate Composition (g/Kg) of the experimental diet

	Sources of fibre		
	RB	MH	SP
Dry matter	986.9	994.8	986.8
Crude protein	156.5	155.6	159.4
Crude Fibre	151.6	146.2	154.4
EE	62.3	63.9	95.0
Ash	96.6	42.5	45.5

Table 4: Response of Rabbits Fed Different Fibre sources

Source	Initial Wt. (g)	Final Wt.(g)	AV. Daily Feed intake (g)	Av. Daily gain (g)	Av. daily crude Fibre intake (g)	Av. daily crude protein	Feed/ gain ratio
Millet husk	651.53	1490.00 ^a	55.37 ^a	17.74 ^a	8.10	8.62 ^a	5.96 ^b
Rice bran	646.43	1369.38 ^b	43.26 ^b	16.30 ^a	6.56	6.77 ^b	9.58 ^a
Sorghum	648.33	1235.00 ^c	46.24 ^b	14.70 ^b	7.14	7.37 ^a	8.52 ^a
Overall Mean	548.76	1364.79	48.30	16.25	7.27	7.57	8.02
SEM	14.71	21.33	4.01	2.33	1.6	1.59	1.64

Column means with different superscripts are significantly different ($p < 0.05$)

Table 5: Digestibility of diets containing RB, MH and SP as fibre source for rabbits

Diets	DM	CP	NFE	EE	CF
Millet husk	67.64 ^b	94.18 ^a	71.85 ^b	82.08 ^a	37.58 ^b
Rice bran	74.28 ^a	95.36 ^a	77.51 ^a	86.47 ^a	54.33 ^a
Sorghum panicle	52.95 ^c	89.32 ^b	57.64 ^c	71.13 ^b	12.26 ^c
Overall Mean	64.96	92.95	69.00	80.09	34.72
SEM	4.20	5.57	4.80	5.17	3.40

Millet husk was superior to RB and SP as a fibre source for growing rabbits. Diet containing MH resulted in improved overall growth and efficiency of feed conversion. This could be because MH had a higher NDF, lower ADF and lower lignin. These components could have improved the utilization of MH based diet. The high lignin content of RB and SP together with their high ADF

content could limit both intake (42.26 and 46.24g/day as against 55.37g/day) and utilization. Lignin is not only largely indigestible itself, but it also lowers the digestibility of cellulose, other complex carbohydrates and other nutrients. The high content of silica and trypsin inhibitor in RB has also been shown to depress growth (Kratzer *et al.* 1974, Raharjo *et al.* 1988). The poor perform-

ance of rabbits on the SP based diet could also be due to the presence of tannin. Bagepalli *et al.* (1980) reported 973mg/100g tannin for red sorghum. Tannin imparts bitter taste, which reduces feed intake and affects amino acid availability. This is particularly significant for the rabbit, which has multiple taste buds on its tongue. Table 5 shows the nutrient digestion of diets containing the various fibre sources. Overall, RB based diet showed a higher digestion of all nutrients. This, however, did not result in better performance. This agrees with the findings of Kratzer *et al.* (1974) who indicated the presence of trypsin inhibitor, a growth-depressing factor in RB. The present study showed that there are differences in the effectiveness with which rabbits utilize fibre from different sources. The degree of utilization depends on the nature of the fibre. In this study, MH is superior to RB and SP as fibre source for growing rabbits. It is recommended that extensive studies should be carried out on other fibre sources to ascertain their effect on rabbit's performance before incorporating them in concentrate diets.

References

- AOAC 1975. Official Method of Analysis. Association of Official Analytical Chemist. 2nd ed. Washington, D.C.
- Atef, M.A and Ahmed, M.A 1986. Effect of Dietary Fibre Levels on Digestibility, Performance and Cecal Microbial Activity in Growing Rabbits. *World. Rev. of Animal Production* 22(4):51-54
- Bagepalli, S.; Narasinga, R, and Parbhavanthi, T. 1980. Tannin content of foods commonly used in India and its influence on ionizable iron. *J. Sci. Food Agric* 3:89-94.
- Champe, K.A. and Maurice, D.V. 1983. Response of early-weaned rabbits to source and levels of dietary fibre. *J. of Anim. Sci.* 56:1105-1114

- Cheeke, P.R; Patton, N.M; Lukefahr, S.D and Johnson. 1987. Effect of weaning and slaughter ages upon rabbit meat production 1. Body weight, feed efficiency and Mortality. *J. Anim.Sci.*46:573.
- Crampton, E.N. and Harris, L.E. 1969. *Applied Animal Nutrition* W.H. Freeman and Company San Francisco.
- Cullison, A.E. 1979. Feeds and Feeding. 2nd ed. Reston Pub. Ins. Virginia pg 449-568
- Jokthan . G.E. (2001). Effect of source and level of fibre on feed utilization by rabbits. *M.Sc Thesis. Dept. of Anim. Sci. A.B.U Zaria.*
- Kratzer, G.H.; Earl, L. Chiravanout, C. 1974. Factors influencing Value of rice bran for chickens. *Poult. Sci.* 53:1195-1197
- Lebas. F and Laplace, J.P. 1977. Growth and digestive transit in the rabbit. Variations determined by physical form, composition and crude fibre content of the feed. *Ann. Biol. Anim. Bioch. Biphys.* 17:535-538.
- Olubukola, O.F. 1995. The utilization of dried poultry manure for rabbit diet. *B. Agric Project report, Dept of Anim. Sci. A.B.U. Zaria.*
- Raharjo, Y.C, Cheeke, P.R., Tangendjaja, B. Patton N.M. 1988. Evaluation of tropical forages and by-products as feeds for rabbit production 2. Rice bran nutritive value. Utilization and effects of Supplementation. *J. App Rabbit Res.* 11:257-263
- SAS 1987. Statistical Analysis Systems. Users Guide version, SAS Institute Inc. Gary NC
- Van Soest, P.J. 1967. Symposium on nutrients of forages and pastures: New Chemical Procedures for evaluating forages. *J. Anim. Sci.* 23:838-843.
- Van Soest, P.J. and Robertson J.B. 1979. Food and fibre. In *Marabou symposium, Naringfarsking Suppl.* 14:12.

(Received 17 February 2002; Accepted 05 January